

QUEST CONTENTS 40



PLANET EARTH

URBAN COMBAT

153-154

Mouseholing - cleaning a corridor - close-quarter fighting - dealing with snipers - strengthening strongpoints - appropriate weapons siting

DECEPTION TECHNIQUES

155-158

Hiding ships - dummies and decoys - inflatable bridges - smoke grenades - fake heat sources - anti-radar nets - toned down landmarks

THE LIVING WORLD

SURVIVAL STRATEGY

159-162

Undersea camouflage - predatory insects - mimicking surroundings poisonous animals - playing possum the chaffinch's flight path



NEW TECHNOLOGY

COUNTER TERRORISM

271-274

Advanced surveillance equipment electronic 'sniffers' - internal security vehicles - the 'wheelbarrow' - body armour - sniper detection system

BOMBS AWAY!

275-278

Counter-insurgency operations – heavy bombers – reconnaissance duties – terrain-following radar – stand-off capability – air-launched cruise missiles

GUNSHIPS

279-280

Offensive missile systems - miniguns automatic targeting - Hellfire rockets -Apache's avionics - thermal imaging equipment - the Soviet helicopter/killer

ENERGY AND RESOURCES

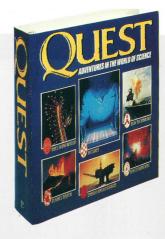
BEAMS IN BATTLE

127-128

Laser target markers – 'smart' shells – tracer rounds – range finding – laser 'blinding' weapons – death rays for global defence



Pack cover: Apache AH-64 attack helicopter; US marine camouflaged for beach landing; Lebanese soldier fighting in Beirut. Fact file cover: Loading a B66 thermo-nuclear bomb on to an FB111 bomber; illustration of the 'wheelbarrow', remote bomb disposal device.



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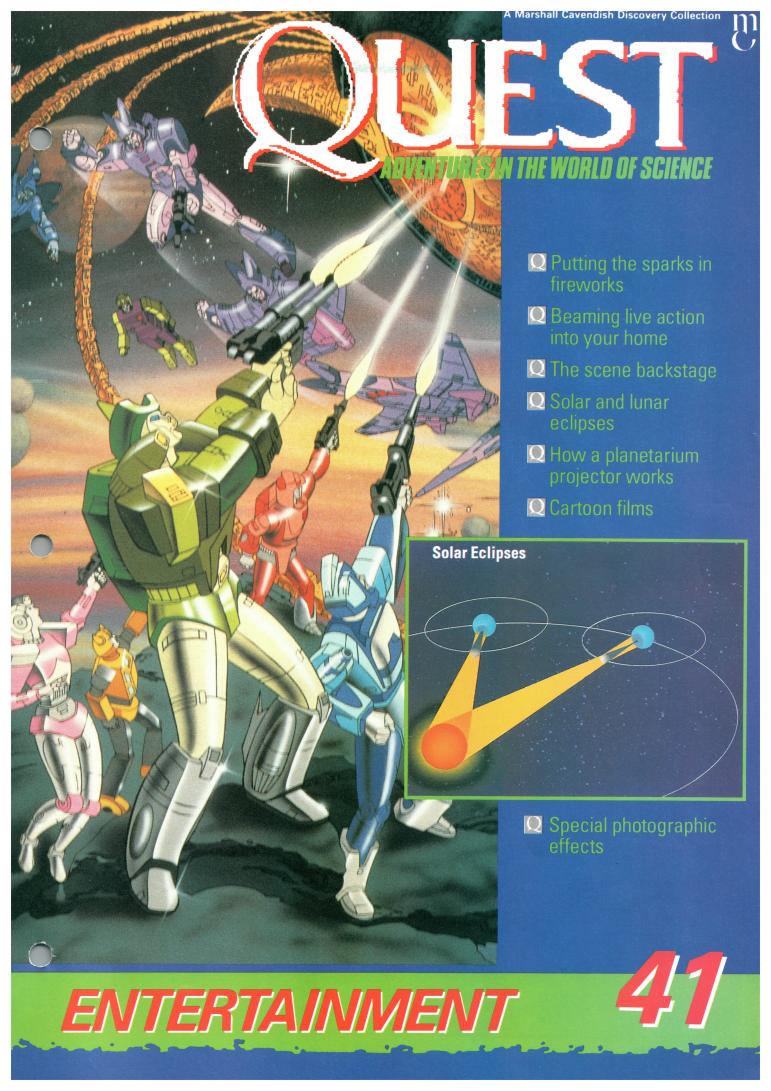
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QUEST CONTENTS 41



PLANET EARTH

GREATEST SHOWS ON EARTH

159-160

Causes of the polar lights - predicting solar eclipses - meteor showers shooting stars - exploding meteorites river bores - volcanoes on Mars

FIREWORKS!

161-162

Gunpowder – rockets – Catherine wheels – adding sparks and glitter – creating colours – putting the bang in bangers – setting up a big display

THE LIVING WORLD





OCEAN WORLDS

Building a dolphinarium – replicating sea water – monitoring salinity – preventing corrosion – filtering and cleaning systems



NEW TECHNOLOGY

DRAWING POWER

281-284

Storyboards - laying down the sound track - synchronizing motion and sound effects - the computer-operated camera panning and zooming effects

OUTSIDE BROADCAST

285-288

Gigantic scanners - monitor banks - the mobile control room - television cameras-- the production crew - transmission links - gun microphones - action replays

BACKSTAGE

289-292

Floating scenery on air cushions – software programs – lighting techniques – versatile lanterns – matchstick-sized microphones – sound equalizing systems

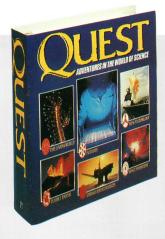


STAR GAZING

45-46

Planetarium projectors - moveable globes - simulating the movement of constellations - new electronic projection systems





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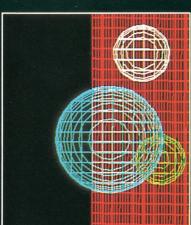
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Pack cover: Firework display (main image); the planetarium at the visitors' centre, Jodrell Bank radio observatory, UK (inset left) and lighting controls, Barbican Theatre, London. **Fact files cover**:

A Marshall Cavendish Discovery Collection



- Q Patterns in nature
- Orienteering
- The search for hidden dimensions
- Weights and measures
- Q 'Rubber sheet geometry'
- Q Surveying systems
- Q The 'Butterfly Effect'



SCIENCE OF NUMBERS



JEST CONTENTS 42



Different 'projections' - distortions topology - surveying systems - relief maps - contour lines - longitude and

latitude

PATTERNS OF CHAOS

167-170

163-166

Deterministic laws - population theories branching shapes in nature - fractal curves - chaos within the human body



THE NUMBERS GAME

Betting systems - limiting the stakes - laws of chance - setting the odds - throwing the dice - games of skill - random numbers

167-170

SHAPES IN NATURE

Fibonacci's numbers - rotational and reflectional symmetry - spiral galaxies and shells - the Golden Rectangle



WEIGHTS AND MEASURES

293-296

'Smart' tools - high-tech spirit levels digital rulers - electronic tape measures and scales - weighbridges - strain guages international units of measurement

HIDDEN DIMENSIONS

Height - width - depth - living in a onedimensional world - two-dimensional beings - time: the fourth dimension - the

universe next door

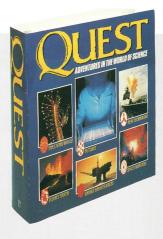


ELECTRONIC ART

107-108

Computer 'sculptures' based on maths distorting basic shapes - 'wireframe' images - 3-D pictures

Pack cover: Fractal geometry as seen on a VDU screen (main image); spiral-shaped shell (inset left); geologists using a theodolite and computer generated images of dice. Fact file cover: a 3-D computer image created by artist William Latham; diagram of a weighbridge.



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INVENTIONS

QUEST CONTENTS 43



THE LIVING WORLD

WONDER DRUGS

171-172

Fighting bacteria – antibiotics – their shapes and structure – penicillin – destroying germs – bursting cell walls – side effects – synthetic strains – allergic reactions

NEW TECHNOLOGY

CAMCORDERS

297-298



VCRs - remote-control units - magnetic pulses - sound signals - tuning into channels - editing features

SMART SETS

299-300

High-definition TV - sharper pictures - wider screens - screen scanning - higher frequency signals - digitized pictures



SPACE FRONTIERS

SPACE PLANES

49-52

Turbojet engines - ramjets - supersonic combustion - cooling systems - two-stage craft - motherships - launch vehicles

FUTURES

CONCEPT CARS

109-112

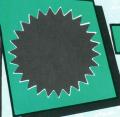


Aerodynamic shapes – automatic warning devices – noise cancellation – the dashboard computer – navigation satellites

MAGLEV TRAINS

113-114

Electrodynamic suspension – magnetic 'wheels' – superconduction – the linear induction motor



ENERGY AND RESOURCES

POWER PACKS

129-130

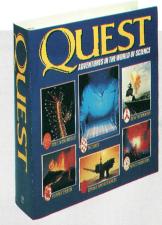
Batteries - cells - ions - the electrolyte - collection points - terminals - circuits - voltage - recharging units

MICROWAVES

131-134

Electrical energy – Earth stations – communication networks – computer links – radar – masers – high speed cookers

Pack cover: European Space Agency's Operation Centre (main image); an entry in 1989 Tokyo Ideas Olympics (inset left); computer simulated air flow over proposed Space plane (inset right). Fact file cover a model of Harmas. The European Space shutter (inset a still video compare)



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- Combine harvesters
- Building roads and digging tunnels
- Pneumatic wrenches
- Fusing vertebrae
- Plastic and reconstruction surgery
- Robot Space tug
- Remote inspection vehicles

7000 S

QUEST CONTENTS 44



PLANET EARTH

SPEEDING THE PLOUGH

171-174

Air-conditioned tractor cabs - shuttle transmission - computerized monitoring rotating-disc ploughs - extendible 'dibbers'

BIG DIGGERS

175-178

Giant rippers - harvesters - articulated arms - backhoe loaders - compressed nitrogen suspension - compacters - paving train - laser theodolite - tungsten carbide picks

NEW TECHNOLOGY

HAND POWER

301-302

Hammer action drills - 'torque control' electric screwdrivers - tungsten carbide blades - alligator-type saw - vacuum cleaning system - steam stripper

DRILLS 'N' FRILLS

303-304

Air turbine drill - interchangeable handpieces - burs - dental amalgam cartridge syringe - dental chairs - cuspidor - fibre optic light guide - ultrasonic scaler

NEW SHARPS

305-308

Sprung forceps - surgical microscope - titanium needle holder - flexible viewing instrument - 'keyhole' surgery



SPACE FRONTIERS

ASTRO NUTS AND BOLTS

53-54

Manned Manoeuvring Unit - Shuttle robot arm - foot restraints - anti-torque tools - multi-purpose power tool - core sampler

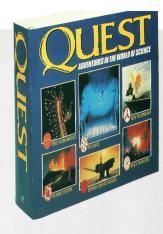
FUTURES

THE CUTTING EDGE

115-118

Profile milling machine – five-axis cutting head – vacuum holding unit – direct numerical control – computer-aided design – computer-integrated manufacture

Pack cover: Astronaut Bruce McCandless performs maintenance work in the cargo hold of the US Shuttle Challenger (main image); a compressed-air grinding tool in use; a touch-sensitive dental tool console. Fact file cover: A giant ripper, used for breaking up hard ground; a torque-control screwdriver.



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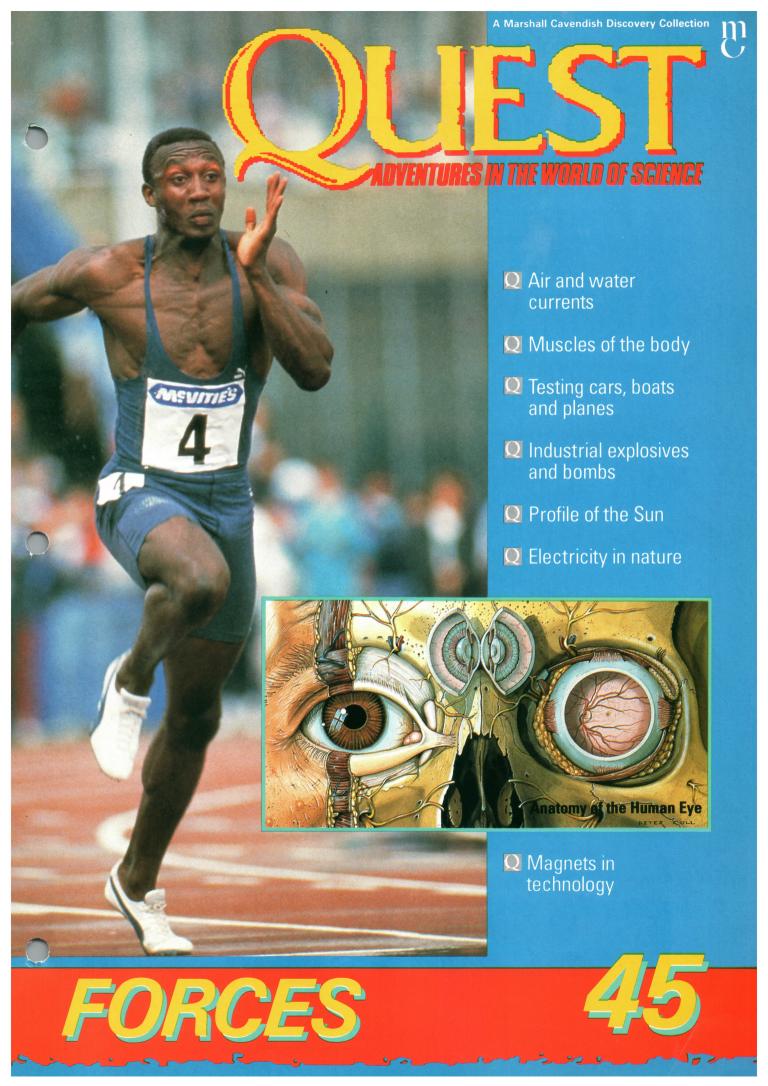
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QUEST CONTENTS 45



PLANET EARTH

THE COMMANDING CURRENTS

179-180

Global air circulation – the trade winds – the doldrums – continental land masses – the Sargasso Sea – whirlpools – waterspouts

THE LIVING WORLD

MUSCLE POWER

173-176

Skeletal muscle - visceral muscle - intercalated disc - fast and slow twitch - force amplification - contractile mechanism



NEW TECHNOLOGY

DESTRUCTION TESTING

309-310

Vehicle test track – sidewind generator – impact-measuring device – test dummies – wind tunnel tests – sea trials – test pilots

EXPLOSIONS

311-312

Shock wave - rapid burning - chemical reaction - nitroglycerine - dynamite - plastic explosives - nuclear weapons

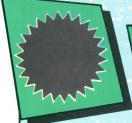
SPACE FRONTIERS

THE MIGHTY SUN

55-58

Crushed atoms – energy generation – convection – sunspots – trapped magnetic fields – prominences – corona – solar wind





FUTURES

LIVING VOLTS

135-138

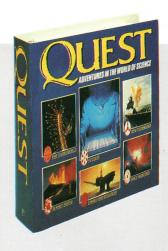
Thunderstorms – static electricity – invisible discharge – ionized air – ball lightning – nerve cell impulses – electroreceptors

NATURAL ATTRACTION

139-142

Magnetite - magnetic poles - lines of force - electromagnetism - atom smashers - magnetic recording - EMP - gamma rays

Pack cover: Kirlian photograph of a steel ball being dropped into a high-energy electrical field (main image); strongman pulling Concorde (inset right); a solar furnace (bottom). Fact file cover: sprinter Linford Christie; artwork of the human eyeball and eyesocket (inset right).



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IEST CONTENTS 51



WORLDS WITHIN WORLDS

204-205

Green plants - carnivores - pitcher plants the top predators - Lake Baikal - shrimp-like amphipod - zooplankton - Bioshpere II

IVING WORLD

STAYING ALIVE

193-196

Ocean depths - gulper eel - dehydrated tardigrades - life in polar regions - waterproof coats - regenerating limbs



EMERGENCY

347-350

Ambulances - poisoning - EMIT cardiopulmonary resuscitation defibrillator - gastric lavage

TO THE ENDS OF THE EARTH

351-354

Polar survival - frostbite - thermal insulation clothing - polar tents - All Terrain Cycle pressure ridges - radio transmission

THE CRUEL SEA

355-358

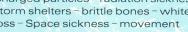
Shipwreck - hypothermia - HELP exposure suits - personal flotation device sea dye markers - emergency locator

71-72





Charged particles - radiation sicknes - solar storm shelters - brittle bones - white cell loss - Space sickness - movement

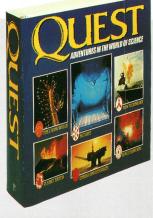




TRASH POWER

135-136

Waste power plants - pyrolysis hydrogeneration - refuse-derived fuel biogas digestors - geothermal power



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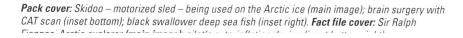
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FUELLING THE BODY

187-190

Inside the body - enzymes - hydrochloric acid - the villi - nutrients - muscle pairs - the heart - motor cortex - energy in food

THE GREEN MACHINE

191-192

Sugar from light - photons - chloroplasts stomata - spongy layer of cells - phloem tubes - artificial photosynthesis

NEW TECHNOLOG

nuclear reactor - fission - cylindrical fuel

NUCLEAR POWER

343-346

Groups of particles - radioactive elements elements - control rods - breeder reactors





BEAMING IT BACK

67-68

Solar cell array - orbiting power stations microwave link - ground station - solar-sail craft - interstellar light - antimatter rocket

NEW FUELS

131-132

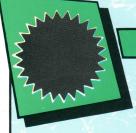
Ethanol - fermenting crops - hydrocarbons - methanol-adapted engines - natural gas variable-fuel vehicle - wind-powered cars



SAVE IT!

133-134

Energy waste - combined heat and power plant - heat-resistant turbine blades energy conservation - 'smart' materials



ELECTRICITY

145-148

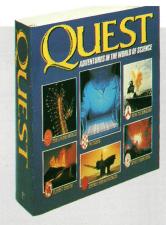
Negatively-charged particles - circuits alternating current - power stations superconductors - voltage difference

KING COAL

149-150

Hi-tech mines - electronic guides - power stations - high-pressure turbine scrubbers - fluidized-bed combustion

Pack cover: Gymnast powered by contracting muscles (main image); electric spark discharged between two metal objects (inset top); molten nuclear waste glass (inset bottom). Fact file cover: Technician in nuclear power plant (main image); methanol-driven car (inset).



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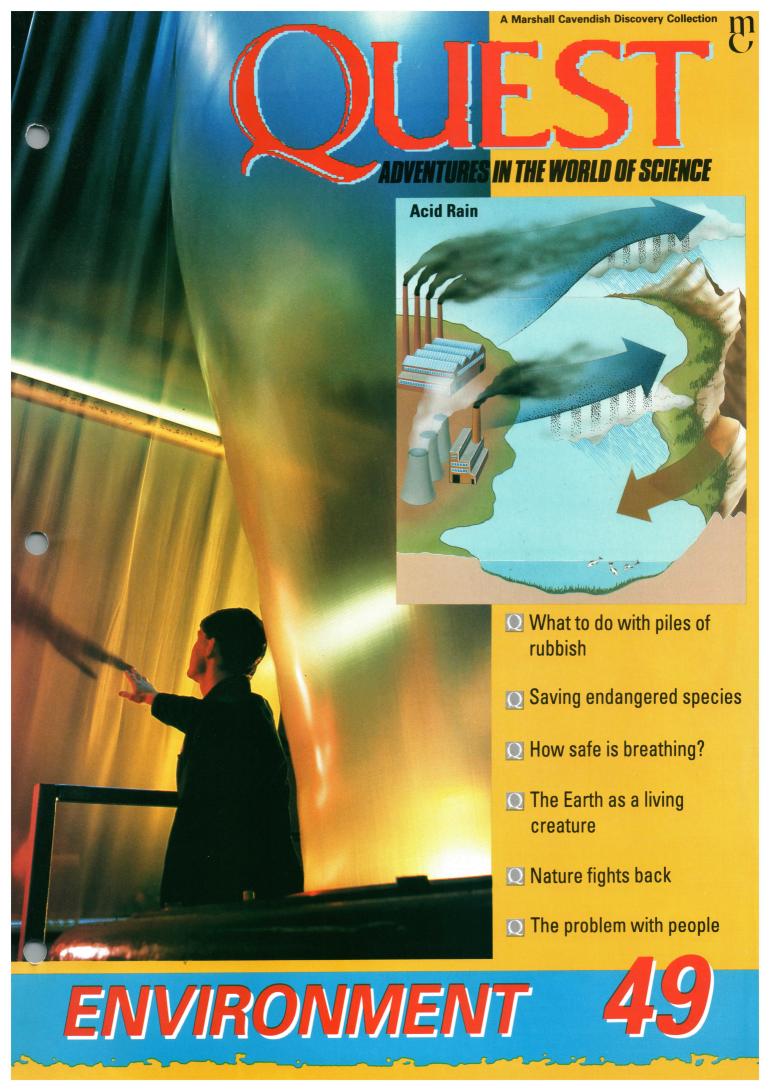
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SOMETHING IN THE AIR

197-200

Smog - carbon monoxide - the hazards of breathing - acid rain - catalytic converters the dangers of lead - hydrocarbons

THE LIVING PLANET

201-204

The Earth goddess Gaia - creatures that make rain - regulating the temperature fixing the level of salt in the seas

THE LIVING WORLD

FACING EXTINCTION 183-184 The black tamarin - adelie penguins puffins - blind river dolphins - rare plants -

NATURE FIGHTS BACK

185-186

Finding new habitats - recolonizing industrial sites - escaped animals - living on the motorways - new species

shark fin soup - ivory-billed woodpecker



GLOBAL GARBAGE CRISIS

341-342

Landfill - burning rubbish - energy recovery - recycling glass - paper reclamation - the persistence of plastic the dangers to wildlife

SPACE JUNK

Tracking debris - dead satellites damaged Space craft - avoiding collisions





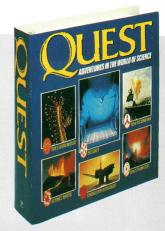


THE BIG SQUEEZE

127-130

The population explosion - greying populations - mortality rates contraception - overcrowding

Pack cover: The Earth as seen from the Moon (main image); a car exhaust pipe belching pollution (left); a smog mask in use (inset right)' Fact file cover: A polythene recycling plant; how acid rain affects the environment.



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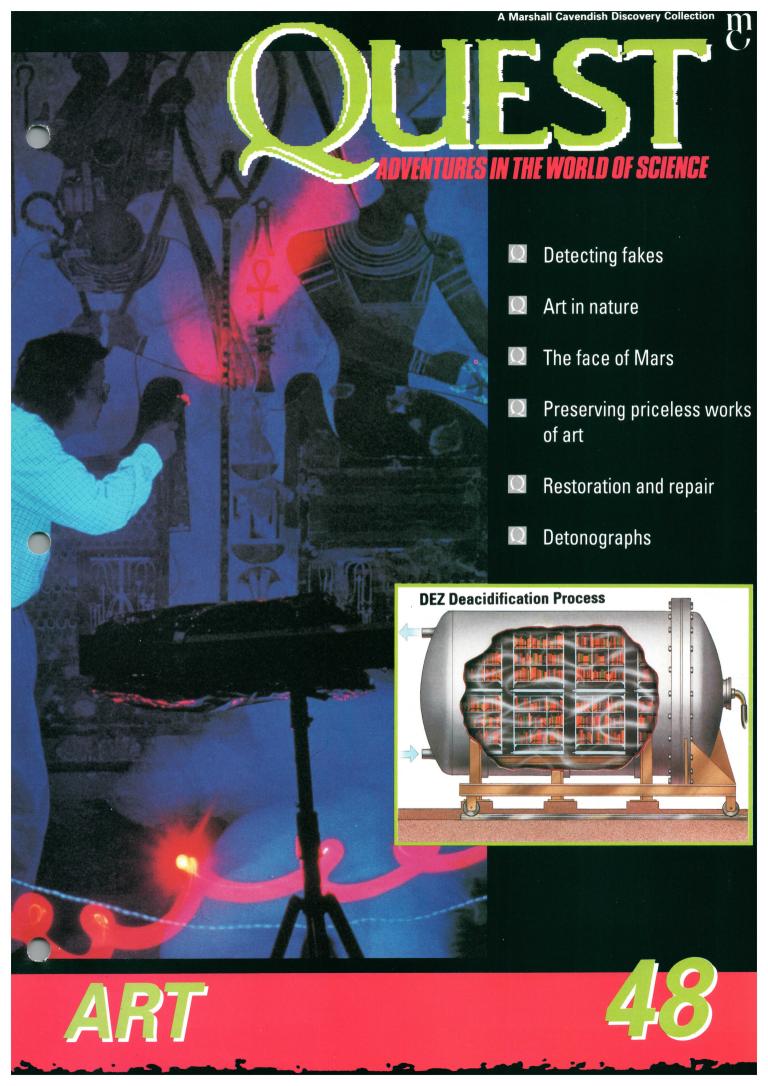
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EST CONTENTS 48



FACE-LIFT

193-196

Infrared light - microscope examination colour graphic display - parallel strips humidity-controlled terrapins

THE LIVING WORLD

NATURAL BEAUTY

179-182



Birds of paradise - male peacocks - dartpoison frogs - heliconid butterflies - nectar guides - tiger lilies - colour for defence



NEW TECHNOLOGY

TRUE OR FALSE?

333-336

Infrared reflectography - digital video camera imaging - laser fluorescence spectroscopy - micrographs

WELL PRESERVED

337-340

Damage by visitors - acid rain - preserving stone - air or water blasting - doubleglazing - neutralizing acid in paper

OUT OF THIS WORLD



Pioneer 10 and 11 - the Pioneer plagues coded information - messages for aliens the Voyager probes - the giant Martian face

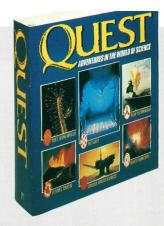


DIFFERENT STROKES

123-126

Kinetic art - explosive bas-reliefs - metallic foils - 6-metre-wide fireball - painting by computer - digitized data - 3-D imaging electrochromic materials - holograms

Pack cover: Computergraphic (main image); monarch butterfly (top right); imaginary cowl over Sphinx (bottom right). Fact file cover: Restoration of Nefertari's tomb; book preservation (inset).



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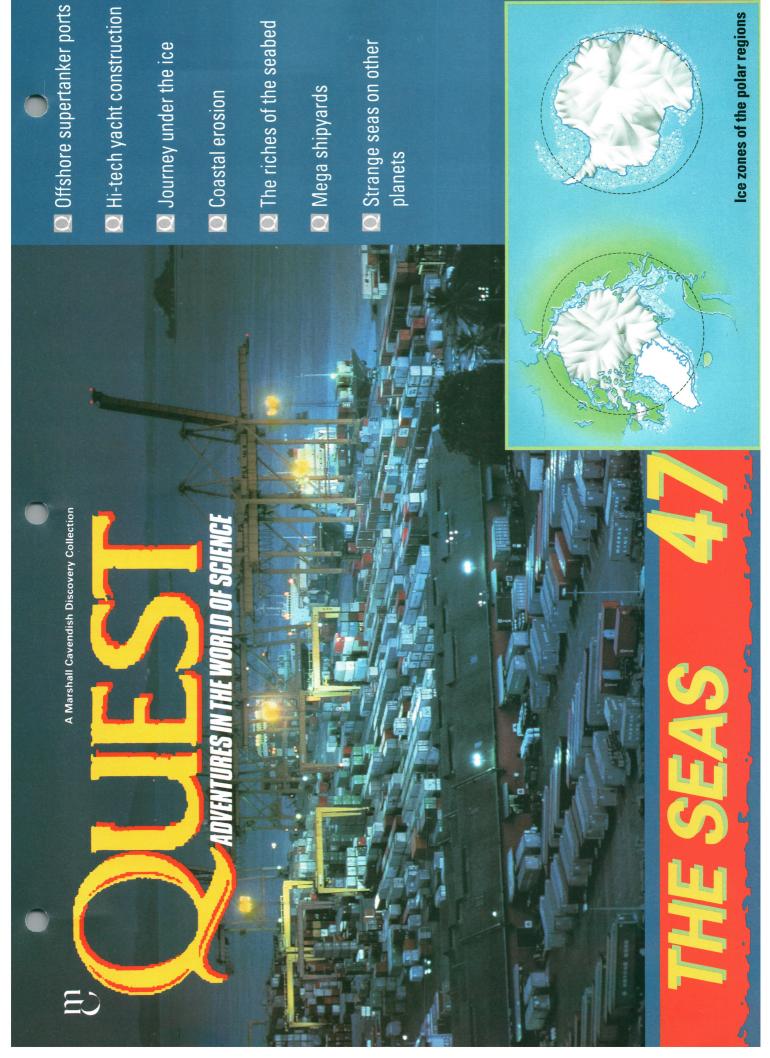
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COASTLINES

185-188

Rocky cliffs - dissolved chemicals - longnore drift - projecting headlands - black sand - submarine bar - rockpools

ICY WATERS

189-192

Permanent ice pack - pancake ice - freezing blizzards - leads - pressure ridges eskimos - phytoplankton - killer whales

NEW TECHNOLOGY

PORTS OF CALL

325-328

Metal containers - straddle carrier - mixed and bulk cargo - deep water channels underwater storage tanks - LASH - ferries



SHIP SHAPE

329-332

Design - scale models - watertight bulkheads - hydraulic presses - prefabricated sections - dry docks



CELESTIAL SEAS

61-62

Water vapour - the greenhouse effect underground frost - radioactive elements liquid ammonia - terraforming

RACING YACHTS

121-122

Computer-aided design - winglets hydrofoil - games theory - low-friction plastic-film multihulls - proas - wingsails

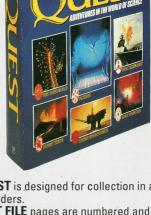




ROCK BOTTOM

143-144

Sand and gravel - deposits of shells - metalrich sands - seaweed - Pacific giant kelp - oysters and pearls - natural sponges



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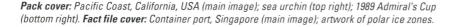
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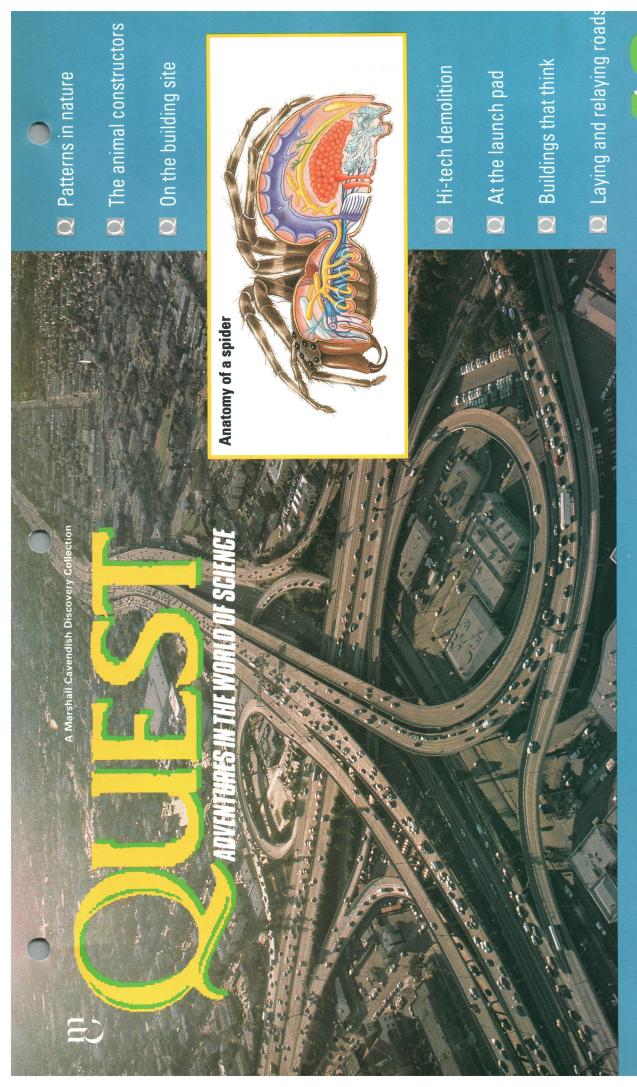
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ISMOIISMOSILEMOSILIOMS I





181-184

Draining the site - bore holes - the Master Programme - road and rail access groundslab - scaffolding - steel frames



HOME SPUN

177-178

Butterfly larvae - spinning cocoons abdomenal glands - silk filaments 'capture' threads - orb-shaped webs





313-316

Aggregate - 'macadam' - hot-rolled asphalt explosive blasting - blast-furnace slag planning the route - bulldozers - the subgrade - concrete train - 'blacktop'

THE CRUNCH BUNCH

317-320

Thermal reaction process - explosives pulverizing jack-hammer - oxyacetylene torches - hydraulic shears - thermic lance recycling - compressed-air hose

GIANT HANDS

321-324

The hoist - bridge cranes - the gantry remote control - slewing - cantilevering arrangements - 'overturning moment' grabs and buckets - telescopic arms

Mobile Launcher Platform - giant crawler

transporter - Fixed Service Structure

Orbiter Access Arm - the 'white room'

BLAST OFF

59-60

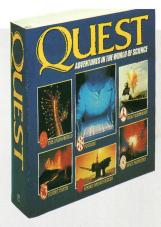




BUILDINGS WITH BRAINS

119-120

Remote control - programmed heating system - home entertainment equipment the integrated office - communications heat sensors - voice controls



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DVENTURES IN THE WORLD OF SCIENCE Arid wastelands on other planets Desert warfare The frozen continent Mining technology beneath the sands How land is lost to the desert The strange creatures of the barren lands F-15E Dual Role Fighter

DESERTS

52



SANDSCAPES

206-209

Hyperarid lands - high-pressure zones sea-water currents - rain shadow weathering and erosion - dunes

ICY WASTELAND

210-213

Southern Ocean - annual precipitation - ice sheets - mountain ranges - South Pole -Scott and Amundsen - factory ships

DUNE WARS

214-217

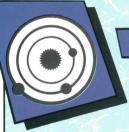
Sandstorms - heat illness - mobile armoured forces - artillery - navigation equipment - desert driving

THE LIVING WORLD

SOME LIKE IT HOT

Drinking the fog - camel's hump - cooling

adaptations - cooling behaviour - storing water - giant saguaro cactus - bottle tree



ARID WORLDS

73-74

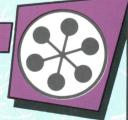
Venus's atmosphere - Viking Lander 1 -Martian volcanoes - ultra-violet light water-eroded channels - permafrost

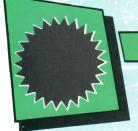
SHIFTING SANDS

137-138

197-200

Desertification - livestock grazing - water erosion - plate tectonics - clearing rainforests - poor drainage - plastic trees



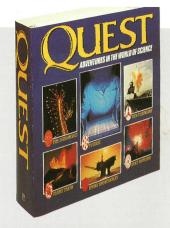


HIDDEN RICHES

151-152

Subsurface formations - satellite prospecting - seismic surveys - drilling for oil - precious materials - salt ponds

Pack cover: Sand dunes in the Sahara desert (main image); a blue-tongued skink (bottom left); tank in the desert (bottom right). Fact file cover: Venus mapped by America's Pioneer probe (main image); cutaway illustration of the US Air Force's F-15E fighter plane in desert camouflage.



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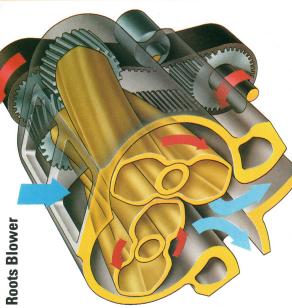
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- How astronauts keep fit
- How much can the human
- Burning up the quarter mile
- Risking life and limb for the





WACKY RACERS

218-221

he Alaskan sled race - Vasa cross-country skiing - Inferno downhill - marathons -Paris-Dakar - round the world yachting

IT'S A MAD WORLD

222-225

Motorcycle jumps - car ramp jumping human cannonballs - wing walking - skiing down Everest - shooting the rapids

THE LIVING WORLD

201-204

ANIMAL PURSUITS

Horse-racing - stud farms - harness races greyhounds - homing pigeons - recordbreaking snails - racing toads



TO THE LIMIT

205-206

Underground burial - extreme cold highest body temperature - greatest underwater depths - g-forces



WHAT A DRAG

359-362

Top fuellers - ultra-light chassis - 'funny cars' - the 'Christmas Tree' - racing head-tohead - special fuels - drag bikes

SPACE FRONT

SHAPING UP IN SPACE

75-76



Wasted muscles - mineral loss - brittle bones - pulley devices - negative-G suit recreational games - Spacewalking

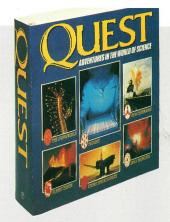


TUNE UP

139-140

Exercise physiology - recovery rate treadmill - heart rate tester - biomechanics - motion analyzer - computer modelling

Pack cover: A supercharged drag racing car leaves the line (main image); athlete Matthew Yates on a treadmill (bottom right); wing walker (bottom left). Fact file cover: The Crane brothers on mountain bikes at over 5,000 metres (main image); illustration of a supercharger (bottom right).



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